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<p>(54) Title: DISPERSIBLE FILM</p> <p>(57) Abstract</p> <p>Bales of unvulcanized rubber, or compounding ingredients for unvulcanized rubber are packaged in film or bags made from an ethylene α-olefin copolymer having a Vicat softening point below 90 °C and a melting point below 100 °C, and optionally a second ethylene copolymer is added to improve processability of the first ethylene copolymer. The second ethylene copolymer will contain more long-chain branches than the first ethylene copolymer. Such films may be included in a rubber compounding operation.</p>		

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DISPERSIBLE FILM

FIELD OF THE INVENTION

5

This invention relates to compositions, films, bags, packages, and compounded materials derived from ethylene based polymer blends .

BACKGROUND

10

In the manufacture of elastomeric mechanical goods and in some polymerization processes, elastomers and/or numerous additives are combined in a plasticized, and/or a blended mix prior to molding, curing or reaction/polymerization of the mix. In certain applications materials may be contained in bags, where the bags
15 with the materials inside have been processed substantially in their totality and incorporated into the end product without removal of the bag or wrap..

For example, in the manufacture of synthetic rubber, such as butyl, chlorobutyl, EPDM, and EPR, raw rubber pieces (referred to as "crumbs") are passed from a
20 reactor through a drying oven, and collected in a compression mold where they are compressed into bales generally in the range of 14" x 28" x 8". The bales are then placed in large containers ("bins") sized to receive 30-45 of the bales for storage and transport. The bales are placed in the bin at elevated temperatures (120°-210°
25 F, 48°C-98°C) which can cause bale to bale sticking if the bales are in direct contact with each other. This is done while the bales are still as warm as practical. Substantially, the sticking and cold flow of the rubber makes it difficult to remove individual bales from the bin. Further, exposure to elevated temperatures during

storage and transit would cause further sticking and cold flow. This sticking led to the development of thermoplastic film bale wrap to separate the bales. Bale wrap film is applied, by conventional in-line equipment, to completely encapsulate or wrap the rubber bale after the drying and molding steps, prior to being placed in the bin. The film prevents rubber-to-rubber contact, and also resists the cold flow of the rubber.

On arrival at a fabricating location (for example, a tire manufacturing location), the bales are removed from the box and the rubber or elastomer is compounded with other ingredients. The other ingredients may be placed with the elastomer in a mixing device. The ingredients may be placed in the mixing device "loose" or preferably in so called "remote" weighing or compound ingredient bags.

In particular, film of the present invention is well suited to form remote weighing bags for materials such as sulfur, peroxide, primary and secondary accelerators, stearic acid, zinc oxide, plasticizers and oils, and other materials added to internal mixers (or blenders, compounding devices and reaction vessels) in small quantities. Such compounding bags also find use for carrying ingredients in many chemical operations such as mixing, blending, compounding, reaction blending and polymerization.

A remote weighing system using compounding bags can consist of a simple manual set-up where a worker pre-weighs batches of specific components, or it could be as elaborate as an automatic form, fill and seal operation. In either case, the result is preweighed, packaged components, increases safety and minimizes health

concerns by which can be introduced to the mixing/compounding process. Such pre-weighing substantially eliminating the need for in-line weighing of ingredients.

Remote weighing with bags has many advantages over the "scoop and shovel" method of addition; i.e., (1) improved housekeeping; (2) improved industrial hygiene; (3) loss control; (4) accuracy and quality control; and (5) labor savings.

Polyethylene has been used for both bale wrap and compounding bags because of its plasticity and antiblock properties, and because it can be obtained at a relatively low cost. Bale wrap films now available include those made from low density homopolymer polyethylene (LDPE), ethylene vinyl acetate (EVA) copolymers, blends of these two or blends of each, with other additives. Polyethylenes previously used for these films have been made from free radical polymerizations, or traditional Ziegler-Natta catalyzed polymerizations. Although LDPE and EVA films were successful in preventing sticking and cold flow of the rubber bales they present other problems. The first of these problems in a stack of rubber bales, is the splitting of film due to insufficient film strength and poor environmental stress crack resistance which occurs due to stress put on the film by the cold flow of the rubber and the nature of the container where the bales are placed.

The second problem is a processing problem after compounding and/or mixing of the elastomer and other ingredients. Many end use applications cannot tolerate the presence of LDPE and EVA in an unmelted, or partially unmelted, state in a rubber or plastic compound. Two solutions to this problem are known. The first solution is to make the bale wrap easily peelable, facilitating its removal prior to placing the elastomer into compounding mixers. See for example U. S. Patent number 4,848,564.

The second solution is to change the melting and softening point behavior of the bulk film. This second solution allows the bale wrap film and/or the compounding bag to be placed in a mechanical mixer still covering the bale or compound ingredients. As the mechanical mixer begins to mix, imparting energy to all components, the heat generated or heat imparted, substantially softens or plasticizes all ingredients to permit formation of a substantially homogeneous rubber or plastic compound which may then be fabricated in to useful articles. In order to achieve this substantially homogeneous mix, the bale wrap or compounding bag must be melted, or at least softened, and then mixed during the mixing cycle. U. S. Patent 5,145,747 approaches this solution by extruding or coextruding an EVA with up to 30% of a compatible wax to depress the Vicat softening point and the melting point of the bulk film. U. S. 5,145,747, adds a wax to a 6-12 wt% VA ethylene copolymer to reduce the Vicat softening point of the EVA. However such EVA materials exhibit a tendency to split and stress-crack during shipment and handling of elastomer bales, negatively effecting the film's ability to protect the elastomer bales. The EVA may have sufficient VA to lower the Vicat softening point to for instance 82°C. However such a VA level will make film formation difficult, and if a film can be formed, the high VA content will make the films very tacky, making the handling of bales wrapped in such a film, very difficult.

The present invention provides an extrudable film forming composition which has a Vicat softening point and melting point low enough to permit its inclusion in a rubber compound while improving the film strength and environmental stress crack resistance.

Summary of the Invention

With the present invention, it has been found that the above-mentioned disadvantages associated with prior art solutions can be minimized or eliminated by the use of a film made from at least one low density polyethylene resin, where the resin has a Vicat softening point up to 100°C and a density up to 0.915 g/cm³. A film having a melt point temperature to achieve such compatibility will generally also allow shorter mixing times for the rubber being compounded, therefore providing for greater productivity. One aspect of our invention, a polyethylene film, formed from an ethylene- α -olefin copolymer or terpolymer, is provided wherein such film has:

- a) a density in the range of from about 0.85 to about 0.915 g/cm³;
- b) a melt index in the range of from about 0.1 to about 10 grams per 10 minutes;
- c) a Vicat softening point not exceeding 100°C;
- d) a melting point not exceeding 120°C;
- e) a CDBI exceeding 50%; and
- f) a M_w/M_n not exceeding 3.0.

Such films provide sufficient sealability at sealing temperatures, as well as splitting and creep resistance, while packaging the rubber bale, and also provide a Vicat

softening point and melting point low enough to enable the wrapped bale or compound ingredient bag to be placed in a mechanical mixer along with other ingredients, and then mixed into a substantially homogeneous rubber compound.

- 5 In a preferred embodiment, a second ethylene polymer is added to improve the melt processability for instance neck-in, of the first ethylene copolymer. The second ethylene polymer may be a polyethylene homopolymer or a copolymer of ethylene and an ethylenically unsaturated ester of a carboxylic acid. The second ethylene polymer is preferably any polymer with sufficient long chain branching to
10 contribute to the melt processability of the first ethylene copolymer. The second ethylene copolymer may have a melt index in the range of from 0.1 dg/min. to 2.0 dg/min., preferably in the range of from 0.1 dg/min. to 1 dg/min.

- In a more preferred embodiment, the first ethylene copolymer is present in the
15 range of from about 75 to about 99 percent by weight of the total blend weight. The second ethylene copolymer or ethylene homopolymer is present in the range of from about 25 to about 1 weight percent based on the total blend weight.

- In the preferred embodiments, it is preferred that a film made from one or more of
20 these ethylene polymers has a Vicat softening point not exceeding 90°C and the melting point does not exceed 110°C. More preferably the Vicat softening point does not exceed 82°C and the melting point does not exceed 100°C.

Description of the Preferred Embodiments

25

Our invention concerns certain films, their production and applications. These films have unique properties which make them particularly well suited for use in certain

compounding or manufacturing operations. These films have combinations of properties rendering them superior to films previously available for many such compounding or manufacturing operations. Following is a detailed description of certain preferred film within the scope of our invention, preferred methods of producing these films and preferred applications of these films. Those skilled in the art will appreciate that numerous modifications to these preferred embodiments can be made without departing from the scope of the invention. For example, though the properties of the film are exemplified in elastomer compounding applications, they have numerous other uses. To the extent our description is specific, this is solely for the purpose of illustrating preferred embodiments of our invention and should not be taken as limiting our invention to these specific embodiments.

Various values given in the text and claims are determined as follows:

15

Melt index (MI): ASTM D 1238 Condition E 190°C, 2.16 kg mass; expressed in g/10 min

Vicat softening point: ASTM-1525 with a 1000 g weight

20

Melting point: Differential Scanning Calorimeter (DSC) second melting curve melting peak in degrees centigrade.

The film of the present invention for use as a rubber bale wrap or compounding bag, has the following properties: good seal strength, a low melting point, good sealability, a low Vicat softening point, resistance to splitting and resistance to stress cracking. The low Vicat softening point and the low melting point improves

the ability of the film to be incorporated into a homogeneous mixture of rubber and rubber compounding ingredients to form homogeneous rubber compounds.

The film of the present invention for use as rubber bale wrap and compounding bags may be made from a single ethylene copolymer or terpolymer, or a blend of such ethylene copolymer with other ethylene copolymers, or with ethylene homopolymers.

In an embodiment of the present invention, a film is made for either bale wrapping or for making compounding bags. In either case, the film must have softening and melting characteristics that permit its inclusion into the rubber compounding process, and such inclusion will result in a substantially homogeneous compounded elastomer blend.

The film may be made from an ethylene α -olefin copolymer or terpolymer (first ethylene polymer). This first ethylene polymer has a density in the range of from about 0.85 to about 0.915 g/cm³, a Vicat softening point less than about 100°C and a differential scanning calorimeter (DSC) second melting point (melting point) not exceeding about 120°C. The α -olefin utilized to make first ethylene polymer is selected from propylene, butene, pentene, hexene, octene and decene. The α -olefin or α -olefins incorporation will be in the range of from about 0.2 to about 20 mole percent, based on the total moles of the copolymer or terpolymer. The first ethylene copolymer has a CDBI exceeding 50%, preferably exceeding 65%. A description of methods for determining CDBI can be found in copending U.S. application 08/230,661. The first ethylene copolymer has a molecular weight distribution as determined by weight average molecular weight divided by number

average molecular weight (M_w/M_n) not exceeding 3.0, preferably not exceeding 2.5, more preferably not exceeding 2.8.

Preferably, the film made from the first ethylene polymer has a Vicat softening point in the range of from about 10°C to about 90°C and a melting point of from about 30°C to about 110°C. More preferably, the film made from the first ethylene polymer has a Vicat softening point in the range of from about 25°C to about 82°C and a DSC melting point in the range of from about 50°C to about 100°C.

The first ethylene polymer may be made by a number of processes, including high pressure, low pressure, gas phase, fluidized bed, slurry or solution processes. Where free radical polymerization is not used, the catalysts used for the polymerization are generally of the metallocene-alumoxane, or metallocene-ionic activator types, although metallocene-alumoxane catalysts are preferred. Such catalysts are well known. Thus, useful catalysts are those disclosed in EP 129368, U. S. Patents numbers 5,026,798 and 5,198,401.

Optionally, a second ethylene polymer may be blended into the first ethylene polymer. The second ethylene polymer is preferably not used for depressing either the Vicat softening point or the melting point of the first ethylene polymer, although such depression is not precluded. The main purpose of the second ethylene polymer is to improve melt processability (reduced neck-in and higher melt strength) of the blend over the processability of the first ethylene polymer alone. The second ethylene polymer is generally a molecule containing long chain branching. Long chain branching is defined herein as a chain length of at least 6 carbon atoms, above 6 carbon atoms the length cannot be determined using ^{13}C nuclear magnetic resonance spectroscopy (NMR). The long chain branch can

- contain as many carbon atoms as the polymer back-bone. Long chain branching is determined using ^{13}C NMR and is quantified using the method of Randall (Rev. Macromol. Chem. Phys., C29 (2 and 3), pages 285-297) the disclosure of which is incorporated herein by reference for purposes of U.S. patent practice. Whereas
- 5 the first ethylene polymer contains less long chain branches. Generally, the fewer the long chain branches, the more difficult the resin is to melt process. Difficulty in processing can be manifested by bubble instability in blown film and draw resonance, surging and/or neck-in in cast films.
- 10 In another embodiment of the present invention, the second ethylene polymer is a polyethylene homopolymer or preferably an ethylene copolymer of ethylene and an ethylenically unsaturated carboxylic acid ester. Preferred ethylenically unsaturated acrylic acid esters include, for example, vinyl acetate, methyl acrylate, butyl acrylate, and ethyl acrylate. A most preferred ester monomer is vinyl acetate.
- 15 These comonomers are present in the second ethylene polymer within a range of from 1 to 35 weight percent, preferably from 1 to 15 weight percent of the unsaturated acrylic acid ester, based on the total weight of the second ethylene polymer.
- 20 The second ethylene polymers are chosen, in general, primarily based on their ability to enhance processability of the first ethylene polymer and their melting points and/or Vicat softening points. That is, the melting points and/or Vicat softening points of such polymers should not have a substantial deleterious effect on these same parameters of the first ethylene polymer, and the film made
- 25 therefrom at the level of inclusion in the blends, but will mitigate processing debits of the first ethylene polymer. In general, a 10% improvement in bubble stability or neck-in would be desirable.

When the second ethylene polymer is included in the manufacture of film, it is present in the range of from about 25 to about 1 weight percent based on the total weight of the blend. The first ethylene polymer is present in the range of from
5 about 75 to about 99 weight percent, based on the total weight of the blend.

In the preferred embodiment, the first ethylene polymer is present in the range of from about 85 weight percent to about 95 weight percent based on the total weight of the blend. The second ethylene polymer is present in the range of from
10 about 15 to about 5 weight percent based on the total weight of the blend. More preferably the second ethylene copolymer is present in the blend at less than 10%, preferably less than 8 weight percent. Also the second copolymer may be present above 10 weight percent, preferably more than 12 weight percent.

15 It should be understood that the first ethylene polymer may be used for film manufacture without the use of the second ethylene polymer. However, in either the case where the first ethylene polymer is used alone, or in the case where it is blended with the second ethylene polymer, it is understood that the Vicat softening point of the resulting film does not exceed 100°C, and the melting point of the film
20 does not exceed 120°C. Preferably, the film made from the blend has a Vicat softening point in the range of from about 100°C to about 100°C, and a melting point of from about 30°C to about 110°C. More preferably, the film has a Vicat softening point in the range of from about 25°C to about 82°C, and a melting point in the range of from about 50°C to about 100°C.

25

It should be further understood that additives often found in films are contemplated by our invention as well. Such additives will be understood by those

skilled in the art to include those that will have an effect on surface characteristics of films, processability of resins being made into films, and thermal stability of resins or film. These, and other types of additives, are normally carried in polyolefins, but may be added without such polyolefin carriers. The additive types
5 mentioned are not meant to be a complete list, but merely illustrative.

In the practice of this invention, the rubber is compounded utilizing a mechanical mixer. The compounded rubber can include mixed unvulcanized rubber with the bale wrap and/or a compounding ingredient bag film of this invention. The
10 compounded rubber can also include accelerators, promoters, curing or crosslinking agents, fillers, colorants, anti-oxidants, and other adjuvants.

Both the rubbers and additives are well known. See for instance, U. S. Patents 4,394,473; 5,145,747; and 4,848,564.

15

Example 1:

A film was made using a slip and anti-block master batch (AMPACET 50568), manufactured by Ampacet Corporation containing 5 weight percent slip and 20 weight percent anti-block, and the remaining 75 weight percent is a 0.3 MI
20 ethylene vinyl acetate copolymer film grade polyethylene resin containing 6 weight percent vinyl acetate. The master batch was added to Exact™ 3027 (a 3.5 melt index, 0.900 density, ethylene butene copolymer polyethylene available from Exxon Chemical Company having a nominal M_w/M_n of 2 and nominal CDBI of 90%) at a 2 weight percent level based on the total weight of the blend. This
25 resulted in a total slip and anti-block levels of 1,000 parts per million (ppm) and 4,000 ppm, respectively.

The film was prepared on a Black Clawson cast film extrusion line run in an embossed mode. The operating rate was 22.8 meters per minute of film. The resin showed a tendency to neck-in, in the range of 35 to 40 cm out of a total die length of 91 cm. While the neck-in was significant, a commercial film could be made.

5 The film would have a Vicat softening point of 76°C and a melting point of 92°C.

Example 2:

A second run was accomplished as disclosed in Example 1. The second run was made using 88 weight percent EXACT™ 3027 low density polyethylene from

10 Exxon Chemical Company, 2 weight percent Ampacet 50568 and 10 weight percent of a 0.31 MI, 6 weight percent vinyl acetate EVA copolymer Escorene LD-317.09 (available from Exxon Chemical Company). The neck-in for this blend was 5 - 10 cm. Three different film thicknesses were produced nominal 50 microns, 44 microns, and 38 microns. The Vicat softening point of the film was 80

15 °C, the melting point was 91°C.

Table I shows the physical properties of the three films thicknesses produced in Example 2.

20 Table II shows various resins that either were made into films or might have been candidates for film making, based solely on the Vicat softening point. However, as experience was gained, the resin's extrudability, its melting point and the splitting or stress crack resistance of a film became of critical concern. Within these parameters, only a few of the films produced met all the requirements, specifically

25 the film of Example 1 and the film of Example 2, EMB-551. The EMB-540 film was marginal due to elevated melting point. Several resins are identified in Table II that were not made into film. However, films made from these polymers would be

expected to have similar, if not equal properties to the bulk resin, such as Vicat softening point and melting point. The results shown on this table would indicate that based in Vicat softening point alone, all of the polymers or films made therefrom would be of interest for bale wrap or compound ingredient bags.

- 5 However, experience has shown that the Attane\ product (XU61512.13, Dow Chemical Company) would be only marginally acceptable in film form (without any additives to lower the melting point), due to the relatively high melting point. Even as mentioned above, the EMB-540 has marginal performance again, due to a higher than desirable melting point.

10

15

20

TABLE I
XEMB-551 FILM
(Example 2)

PHYSICAL PROPERTIES

<u>TARGET GAUGE</u> (microns)	38	44	50
ACTUAL GAUGE (microns)	37	45	51
COF	0.090	0.115	0.130
MD ULTIMATE TENSILE (grams)	3287	4006	4445
TD ULTIMATE TENSILE (grams)	2768	3022	4072
MD ELONGATION (%)	541	567	558
TD ELONGATION (%)	623	592	651
MD TENSILE at 10% (grams)	375	461	472
TD TENSILE at 10% (grams)	321	416	472

TABLE II

Resin	Film Designation	Softening Point Vicat °C	Melting Point °C	Split/Stress Crack	Extrudable
*LD-326.05 (0.3 MI, 6% VA)	EMB-540	83	104	Occasional	Yes
*LD-318.92 (2 MI, 9% VA)	XEMB-547	80	99	Yes	Yes
*EXACT 3002.4.0 MI (0.9034 density)	(NONE)	81	94	Not Tested	Not Run
EXACT 3027* (3.5 MI, 0.900 density)	EXAMPLE 1	76	92	Not Tested	Yes
+ATTANE XU 61512.13 3.96 MI (0.9037 density)	(NONE)	76	124	Not Tested	Not Run
Example 2 (88% Exact 3027, 10% LD317.09, 2% Ampacet 50568)	XEMB-551	80.3	90.95	No	Yes
*UL208ME ¹ (2.51 MI, 8.5% VA)	EMB-547 E	77	—	No	Yes
LD-705.16 (0.4 MI < 13.3% VA)	EMB-549	77	92	Yes	NO ²

*Available from Exxon Chemical Company

+A product of the Dow Chemical Company

•Available from Exxon Chemical Belgium

¹Not available in the United States²Could not be drawn down below 3 mils in cast equipment

TABLE III

SPLITTING PERFORMANCE

5

Film of Example 2 used to Wrap Butyl Rubber Bales:

<u>Film Thickness</u> (microns)		<u>38</u>		<u>44</u>		<u>50</u>	
10	<u>Days Aging</u>	8	12	8	12	8	12
<u>Bale Packout Temperature</u>							
	62.5°C	no	----			----	----
	68°C	no	----	no	no	----	----
	64.5°C	----	----	----	----	no	----
15	70.5°C	----	----	----	----	----	no

---- not tested

All bales shown in Table III were loaded at the temperatures shown at a commercial facility at commercial conditions. Nearly 40% of all bags at all
 20 temperatures had no tears. The remaining 60% had minor tears attributable to impact or abrasion, but none due to cold flow splitting.

As shown in Table II, films were made from a 0.3 MI, 6% VA (EMB-540) had occasional splitting and stress cracks after storage. However, due to a slightly
 25 high Vicat and melting point, an improvement was sought. An EVA with a higher MI and a higher VA content would have lower Vicat softening point and lower the melting point properties.

The XEMB-547 and the EMB-547-E were made from resins with 2MI, 9% VA and 2.5 MI and 8.5% VA respectively, but both exhibited unacceptable splits and stress cracking. Another attempt to achieve the correct balance of properties was EMB-549 (0.4 MI, 13.3% VA). This film provided the proper Vicat and melting
5 point, but again showed poor split and stress crack resistance and poor extrudability. The film of the present invention showed the best combination of properties.

Table III contains further data on whether splits or stress cracking in the film were
10 observed during storage under conditions (number of days and temperature) such shown in Table III for 3 different film thicknesses of the film of Example 2.

Table III shows the film as produced in Example 2, in three thicknesses, where the film was used to package bales of butyl rubber, stored for from 8 to 12 days. Bale
15 temperatures at loading, ranging from about 62.5°C to 70.5°C, were noted as the loading temperature will have an effect on the creep and cold flow of the rubber, the creep and cold flow are contributing elements to splitting and stress cracking.

We claim:

1. A process for preparing a film having low neck-in during extrusion, said
5 process comprising:
 - a) blending a first ethylene copolymer or terpolymer and a second
ethylene copolymer or terpolymer; where said first ethylene
copolymer is present in a blend in the range of 75 to 99 percent by
10 weight, preferably in the range of 80 to 90 weight percent based on
the total weight of the blend; wherein said first ethylene copolymer
is an ethylene α -olefin copolymer; where the α -olefin is present in
the range of 0.2 to 20 mole percent based on the total moles of the
copolymer or terpolymer, preferably the α -olefin is selected from
15 the group consisting of butene-1, pentene-1, hexene-1, octene-1
and combinations thereof, said first ethylene copolymer has a
density in the range of 0.85 to 0.915 g/cm³, preferably in the range
of from 0.85 to .091g/cm³, more preferably in the range of 0.85 to
0.90 g/cm³, a Vicat softening point less than 100°C, said first
20 ethylene copolymer being formed in the presence of a metallocene
catalyst; with a second ethylene copolymer said second ethylene
copolymer containing long chain branching, said second ethylene
copolymer is present in said blend in the range of from 1 to 25
weight percent, preferably in the range of 10 to 20 weight percent,
25 said second ethylene copolymer having in the range of from 65 to
about 99 weight percent ethylene preferably from 85 to 95 weight
percent ethylene and in the range of from 1 to 35 weight percent,

preferably from 5 to 15 weight percent of an ethylinically unsaturated ester, where said ester is selected from the group consisting of vinyl acetate, methyl acrylate, butyl acrylate and ethyl acrylate, wherein said film has a Vicat softening point in the range of from 10°C to 90°C, preferably from 25 to 82°C and a melting point in the range of from 30°C to 110°C, preferably from 50°C to 100°C.

2. The use of the film made by the process of claim 1 as a bag, said bag preferably containing rubber compounding ingredients.
3. The use made by the process of claim 1 to wrap an elastomer.
4. A film having at least one layer comprising a polymer blend, said polymer blend having:
 - a) a first ethylene copolymer or terpolymer present in said blend in the range of from 75 to 99 percent by weight, preferably in the range of from 80 to 90 percent by weight, said first ethylene copolymer or terpolymer being an ethylene- α -olefin copolymer, said α -olefin being present in said copolymer or terpolymer in the range of from 0.2 to 20 mole percent based on the total moles of the copolymer or terpolymer, preferably the α -olefin is selected from the group consisting of propylene, butene-1, pentene-1, hexene-1, octene-1, decene-1, and combinations thereof, said first ethylene copolymer preferably has a density in the range of from 0.85 to 0.915 g/cm³, preferably in the range of from 0.85 to 0.91 g/cm³, more

preferably in the range of from 0.85 to 0.90 g/cm³, said first copolymer having a CDBI greater than 50 percent, preferably greater than 65 percent, said first copolymer having a M_w/M_n less than 3, preferably less than 2.8, more preferably less than 2.5, and a Vicat softening point less than 100 °C, said first ethylene copolymer being formed in the presence of a metallocene catalyst; and

- b) a second ethylene copolymer, containing long chain branching, present in the range of from 1 to 25 percent by weight preferably in the range of from 10 to 20 percent by weight based on the total weight of the polymer blend, said second ethylene copolymer having in the range of from 65 to 99, preferably in the range of from 85 to 95 percent by weight of ethylene and in the range of from 1 to 35 percent by weight of an ethylenically unsaturated ester based on the total weight of the second ethylene copolymer, preferably said ethylenically unsaturated ester is selected from the group consisting of vinyl acetate, methyl acrylate, butyl acrylate and ethyl acrylate said second ethylene copolymer has a melt index below 0.5 dg/min.;

wherein said film has a Vicat softening point in the range of from 10°C to 90°C, preferably from 25 to 82°C and melting point in the range of from 30°C to 110°C, preferably from 50 to 100 °C.

5. A film forming composition comprising:

a) from 75 to 99 weight percent of an ethylene copolymer or terpolymer having a density of from 0.85 to 0.915 g/cc and a CDBI greater than 50 percent, preferably greater than 65 percent;

5 b) from 1 to 25 percent of a long chain branched interpolpolymer of ethylene and an ethylinically unsaturated ester;
the melt index of a) being below that of b), percentages based on the total weight of a) + b).

10 6. The film according to claim 4 in which the melt index of a) is greater than 1 dg/min., and the melt index of b) is less than 1 dg/min.

7. The film according to claim 6 used to make a bag for containing rubber compounding ingredients or to wrap rubber bales or both.

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8. A package comprising:

a) an article selected from at least one of unvulcanized or vulcanized rubber or compounding ingredients for unvulcanized rubber
20 packaged in;

b) a bag or film made from a blend of ethylene copolymers, said blend having: (i) a first copolymer comprised of ethylene and at least one α -olefin, said α -olefin selected from the group consisting of butene, pentene, hexene, octene or decene, said first copolymer having a
25 density in the range of from 0.85 to 0.91 g/cm³, said first copolymer being present in said blend in the range of from 85 to 99

percent by weight of the total weight of the blend; and (ii) a second copolymer comprised of ethylene and a comonomer selected from the group consisting of vinyl acetate, ethylene acrylate, butyl acrylate, and methyl acrylate, said comonomer being present in said second copolymer in the range of from 1 to 35 percent by weight of the total second copolymer composition;

wherein said bag or film has a Vicat softening point not exceeding 90°C preferably in the range of from 25 to 82°C and a melting point not exceeding 100°C preferably in the range of from 50 to 100°C.

9. A bale of rubber covered and in contact with a film, characterized in that the film is made from an ethylene α -olefin copolymer, said polymer being made from a metallocene-alumoxane catalyst system, wherein said polymer has a density in the range of from 0.85 to 0.910 g/cm³, wherein said film has a Vicat softening point not exceeding 90°C preferably in the range of from 25 to 82°C and a melting point not exceeding 110°C preferably in the range of from 50 to 100°C.

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10. A compounded rubber comprised of a mixture of an unvulcanized rubber and a film for wrapping said unvulcanized rubber, said film being made from a blend of a first ethylene copolymer and a second ethylene copolymer, said first ethylene copolymer is an ethylene- α -olefin copolymer, wherein said α -olefin copolymer is one of butene, pentene, hexene, octene and decene, said first ethylene copolymer having a density in the range of from 0.85 to 0.910 g/cm³ preferably in the range of from 0.85 to 0.90

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g/cm³, wherein said second ethylene copolymer is preferably a copolymer of ethylene and a comonomer selected from the group consisting of vinyl acetate, ethyl acrylate, methyl acrylate, and butyl acrylate, said comonomer being present in said second ethylene copolymer in the range of from 1 to 35 preferably 1 to 15 weight percent based on the total weight of said second copolymer, wherein said first ethylene copolymer is present in said film in the range of from 5 to 15 weight percent based on the total weight of said film and wherein said film has a Vicat softening point not exceeding 90°C preferably not exceeding 82°C, and a melting point not exceeding 110°C preferably not exceeding 100 °C.

INTERNATIONAL SEARCH REPORT

National Application No
PCT/US 94/11126A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C08L23/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C08L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 436 196 (SYFAN) 10 July 1991 see page 2, line 44 - page 3, line 11 ---	1-6
X	EP,A,0 351 744 (VISKASE CORPORATION) 24 January 1990 see page 5, line 13 - line 43 ---	1-6
X	EP,A,0 479 579 (MITSUI PETROCHEMICAL) 8 April 1992 see Abstract see claim 1 ---	1-6
A	US,A,4 378 067 (K.D. BUTLER) 29 March 1983 see claims 1-13 ---	7-10
A	EP,A,0 342 822 (EXXON CHEMICAL) 23 November 1989 see claims 1-14 -----	7-10

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

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